Mohawk Forest Resource Assessment

Availability of wood fuel for wood energy in northwestern Massachusetts

March, 2016

Innovative Natural Resource Solutions, LLC

DOER

Massachusetts Department of Energy Resources

Presentation Overview

- Background and purpose of the Assessment
- Forest Inventory and Analysis data
- Northern Forest Biomass Project Evaluator model runs
- Other sources of wood fuel
- Chapter 61 and 132 information
- Siting a wood pellet plant in the Mohawk region
- Conclusion

Background and purpose of the Assessment

- Mohawk Forest Resource Assessment is part of a larger project – the Mohawk Trail Renewable Heat Initiative (MTRHI) – designed to evaluate the economic development potential of extensive privately owned woodlands in western Massachusetts.

- MTRHI is a partnership of the Massachusetts Executive Office of Energy and Environmental Affairs, Franklin Regional Council of Governments (FRCOG), Berkshire Regional Planning Commission (BRPC), Franklin Land Trust (FLT) and the Massachusetts Department of Energy Resources (MA DOER).

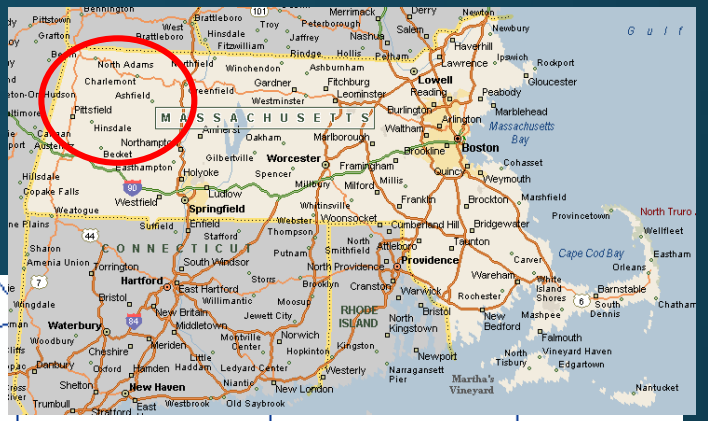
This Assessment will be followed by a series of other studies and analyses through MA DOER:

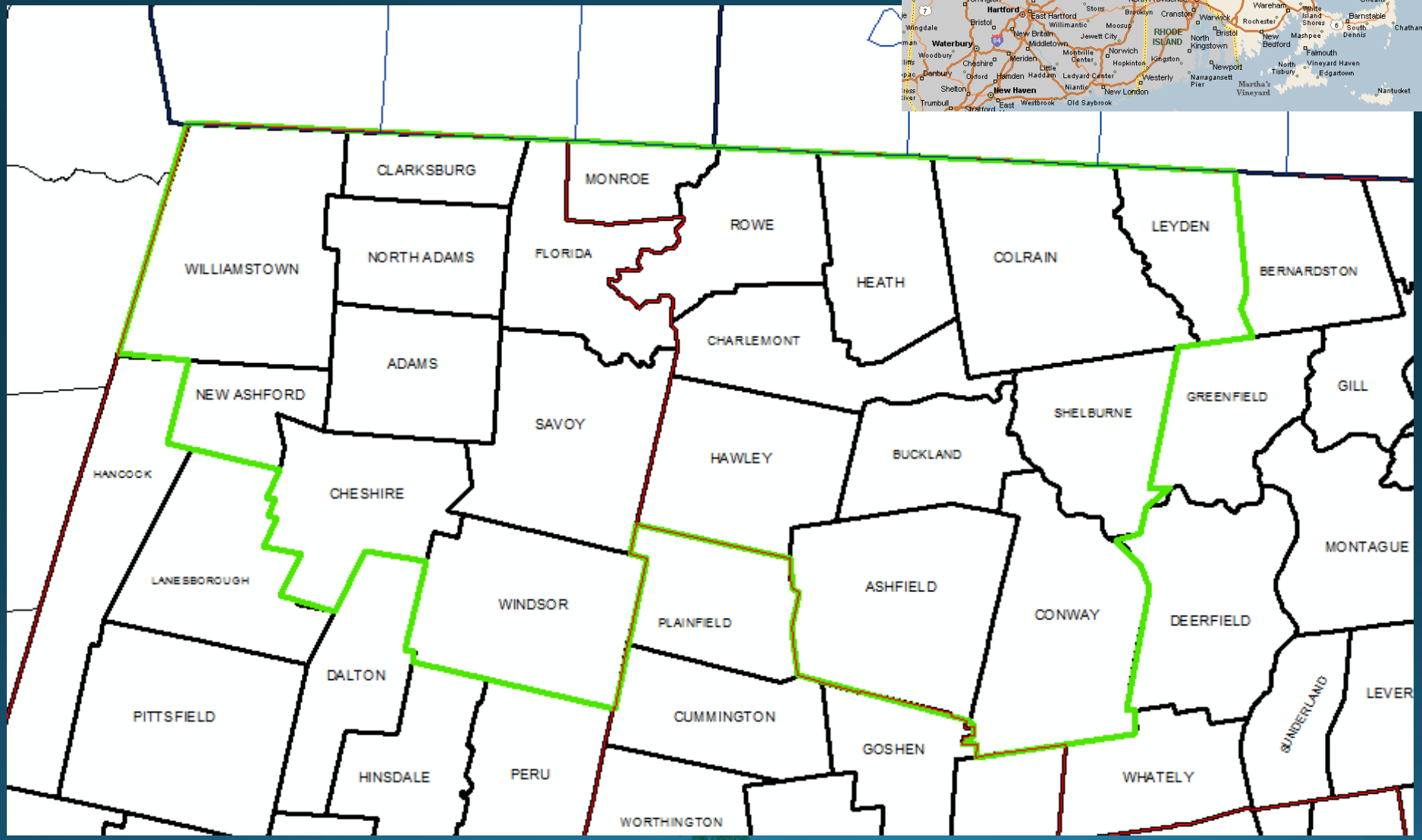
- Quantify the Carbon Balance of the Regions Forests and Potential Air Quality Impacts;
- Market Analysis and Development;
- Development of a Wood Pellet Manufacturing, Storage and Distribution Business Plan;
- Regional Economic Impact Study.

Background and purpose of the Assessment (cont.)

This Assessment is the first in the series and its purpose is to gain an understanding of the availability of low-grade wood resources that could be used for wood pellet manufacturing and production of semi-dry refined wood chips in the northwestern Massachusetts 20-town region.

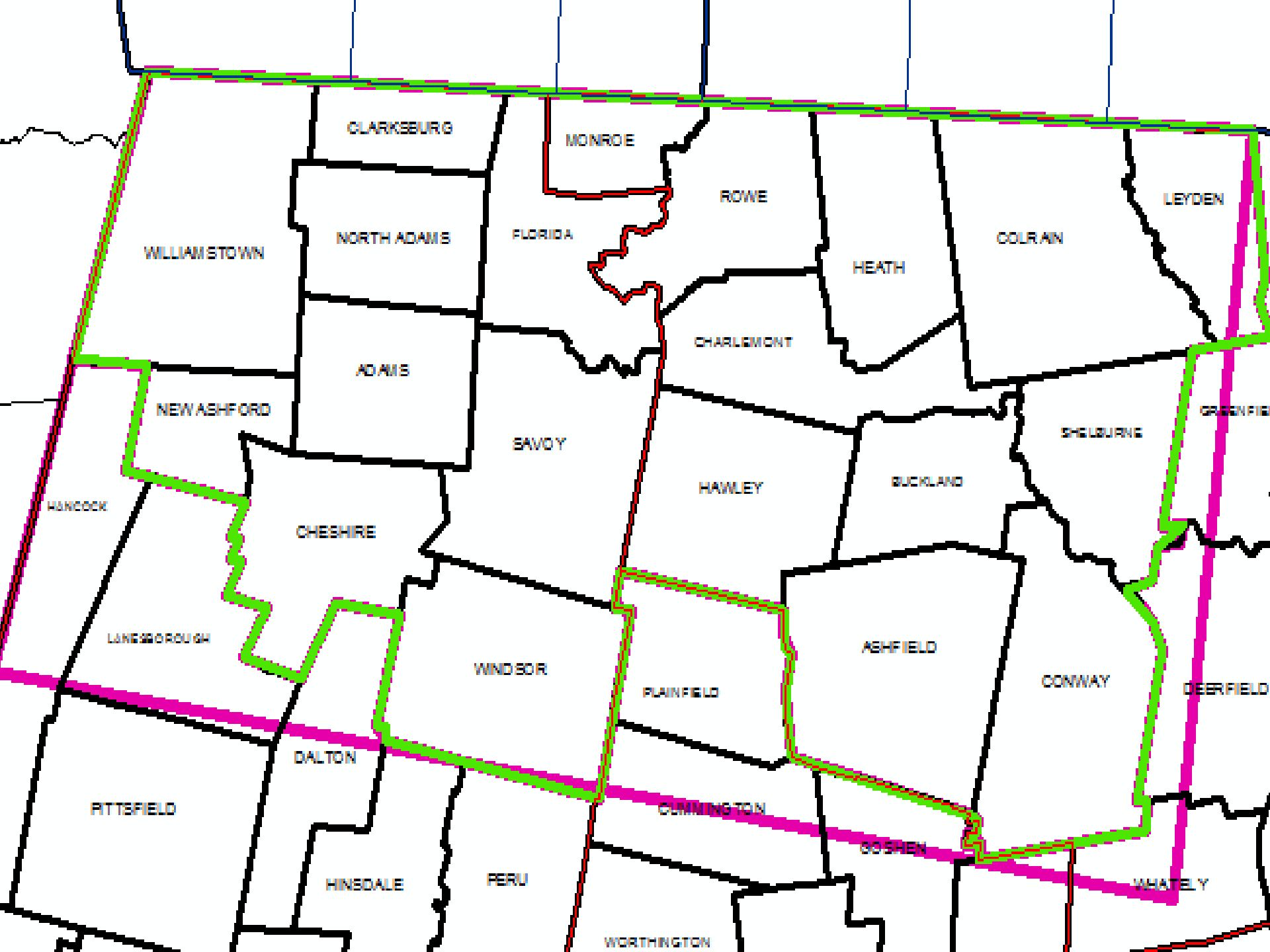
Background and purpose of the Assessment (cont.)



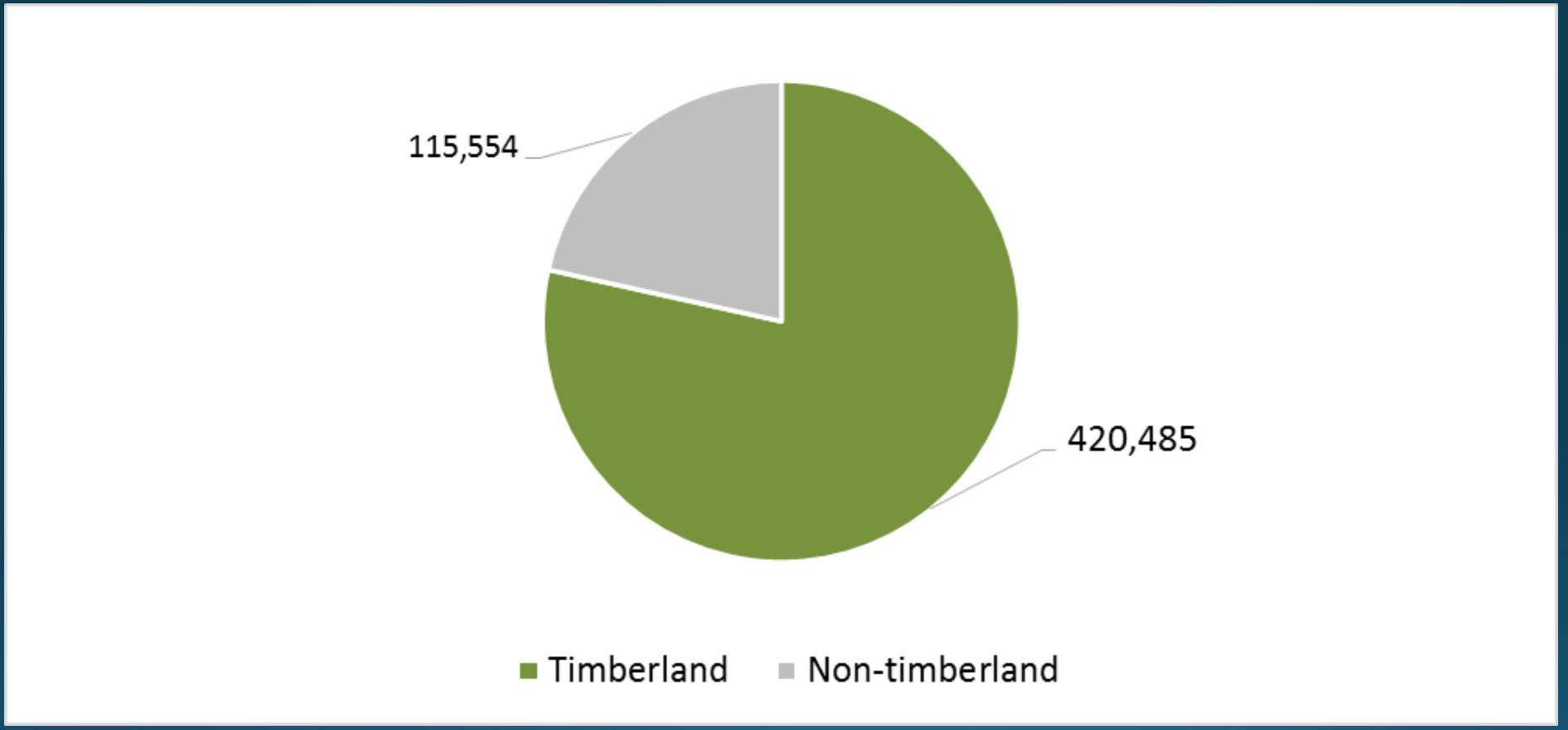


Forest Inventory and Analysis data

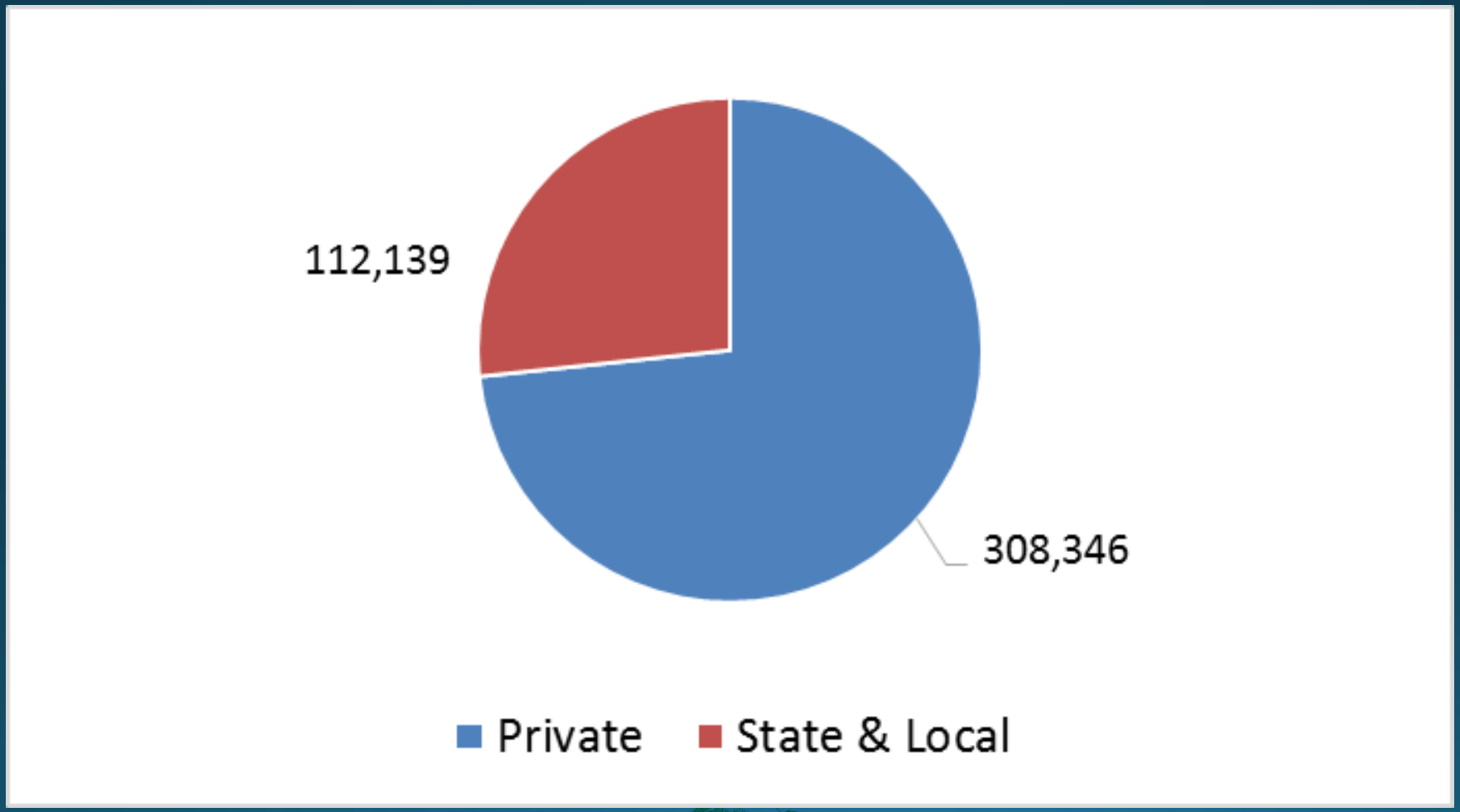
- Most reliable data and information about the forests of the United States comes from the USDA Forest Services Forest Inventory & Analysis (FIA) dataset.
- A series of fixed plots throughout the forests of the U.S. that are re-measured every 6 years to provide constantly updated information about the trees and forests of the country.
- Data includes: number of trees, tree volume, trends and many other forest and tree information.
- Forest Service provided special data access for the 20-town region for this project. Usually just county or circular data area.


CLARKSBURG
MONROE
ROWE
LEYDEN
WILLIAMSTOWN
NORTH ADAMS
FLORIDA
HEATH
COLRAIN
CHARLEMONT
ADAMS
NEW ASHFORD
SAVOY
HANCOCK
HAWLEY
BUCKLAND
SHELBURNE
CHESHIRE
LANESBOROUGH
WINDSOR
PLAINFIELD
ASHFIELD
CONWAY
DEERFIELD
DALTON
PITTSFIELD
CUMMINGTON
GOSHEN
WHATELY
HINSDALE
PERU
WORTHINGTON

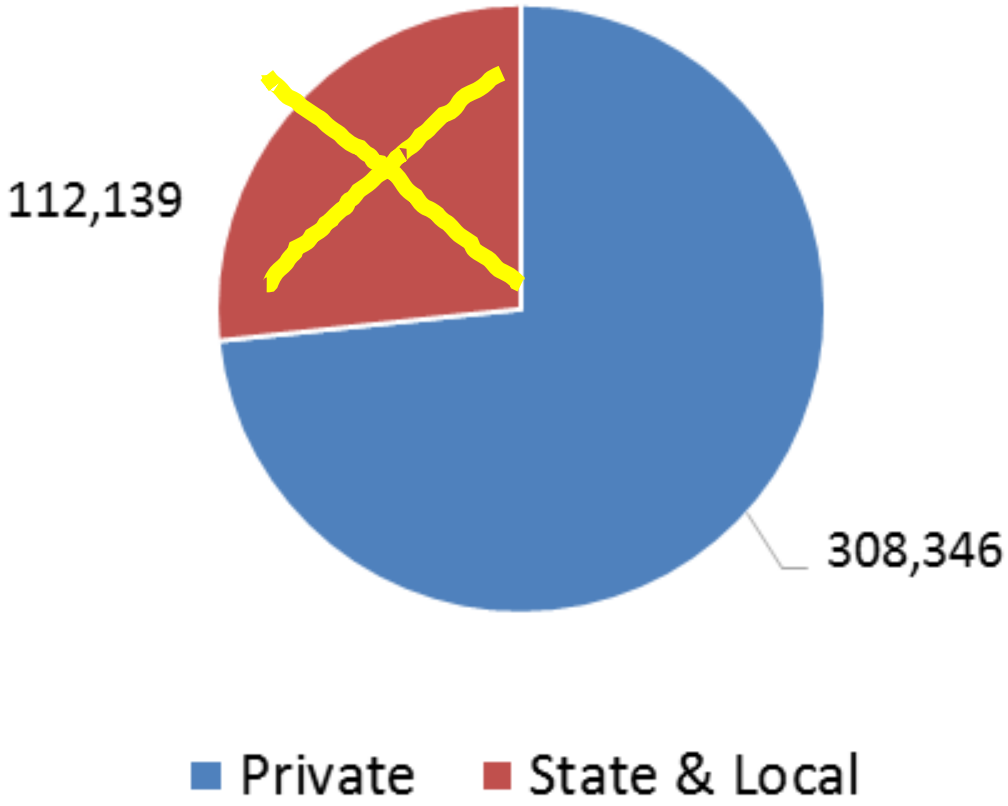
Timberland Acreage – Mohawk region



Timberland Ownership in the Region (acres)



Timberland Ownership in the Region (acres)



Forest Inventory and Analysis data (cont.)

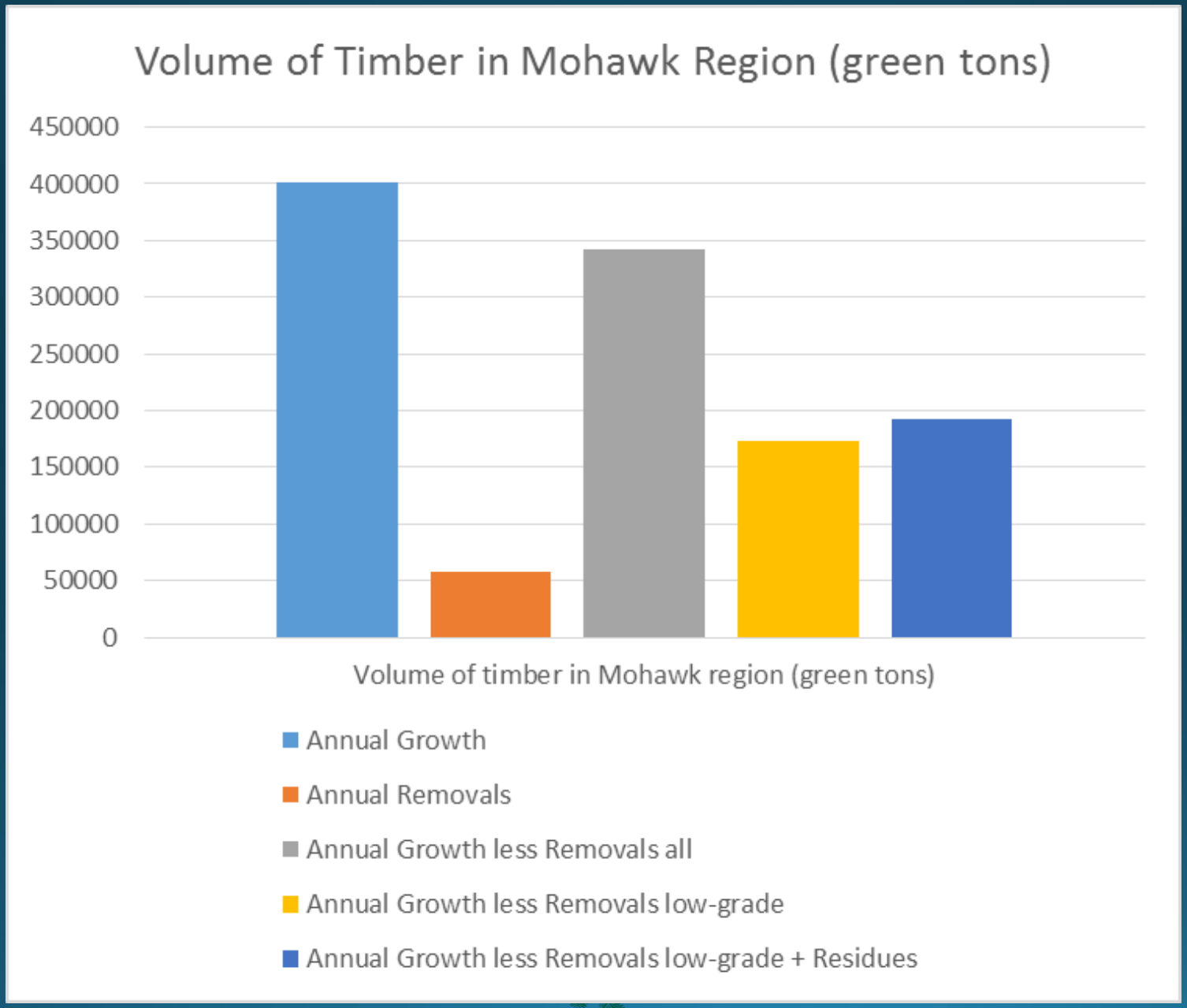
Standing Timber, Growth and Removals for Region

	Softwood	Hardwood	Total
	green tons/yr		
Growing Stock			
• all	5,927,239	17,084,561	23,011,800
• sawlog	5,885,290	10,297,407	16,182,697
• non sawlog	41,949	6,787,155	6,829,103
Growth			
• all	162,304	238,351	400,655
• sawtimber	62,351	118,790	181,141
• non sawlog	99,953	119,561	219,514
Removals			
• all[1]	-	58,083	58,083
• sawtimber	-	12,455	12,455
• non sawlog	-	45,628	45,628
Growth less			
• all	162,304	180,268	342,572
• sawtimber	62,351	106,335	168,686
• non sawlog	99,953	73,933	173,886

A common sustainable harvest level is to only harvest up to growth so that forest stocks at least stay constant or increase over time (we assume that here).

	Softwood	Hardwood	Total
	green tons/yr		
Growth less Removals (non –sawtimber)	99,953	73,933	173,886
Residue	-	19,167	+ 19,167
All Low-Grade			193,054

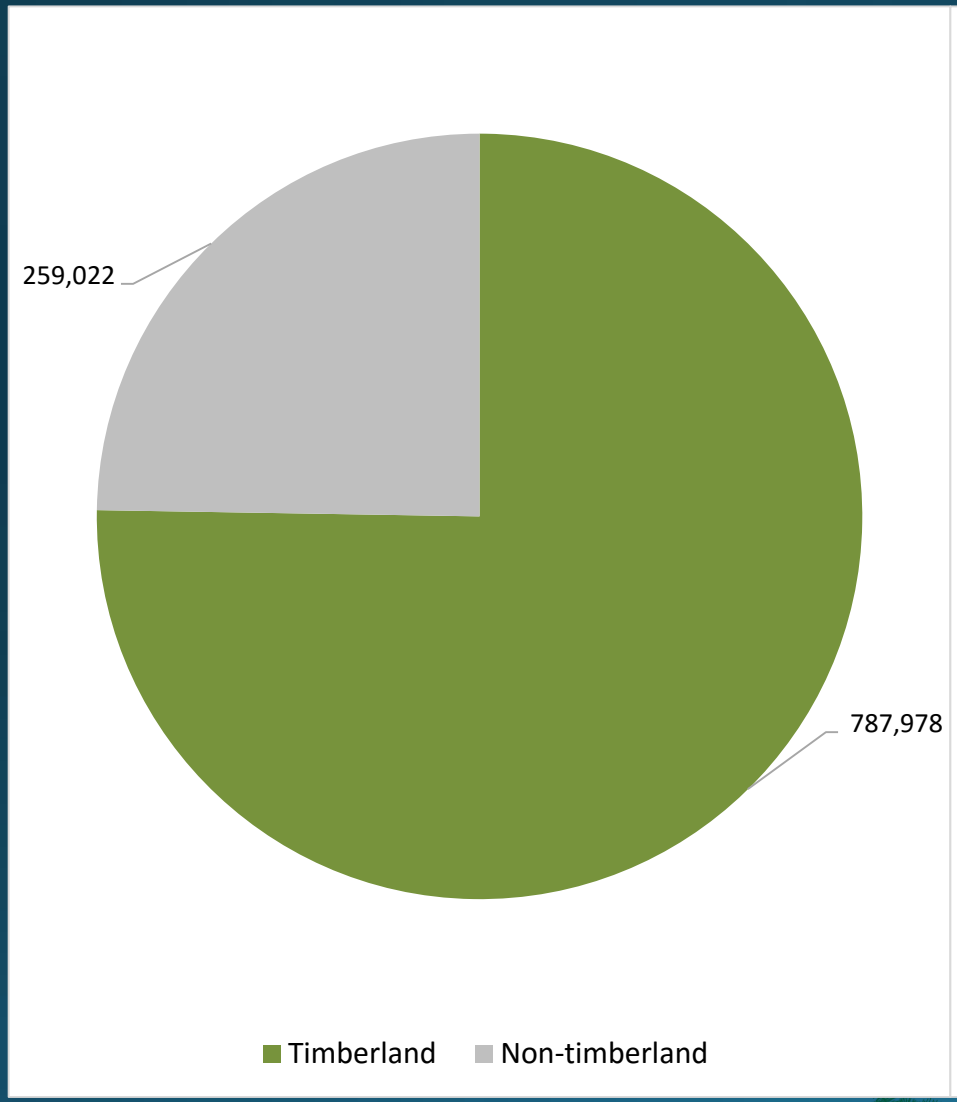
Forest Inventory and Analysis data (cont.)

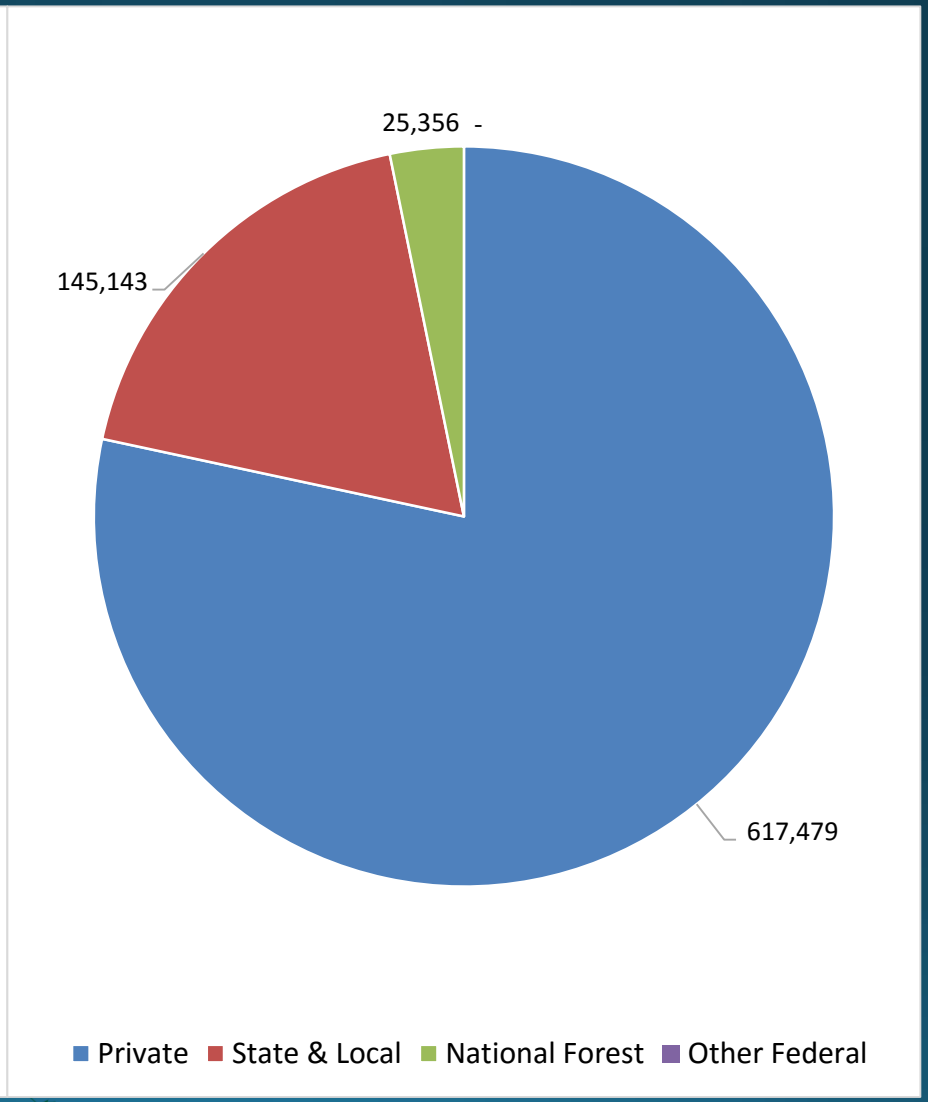


Forest Inventory and Analysis data (cont.)

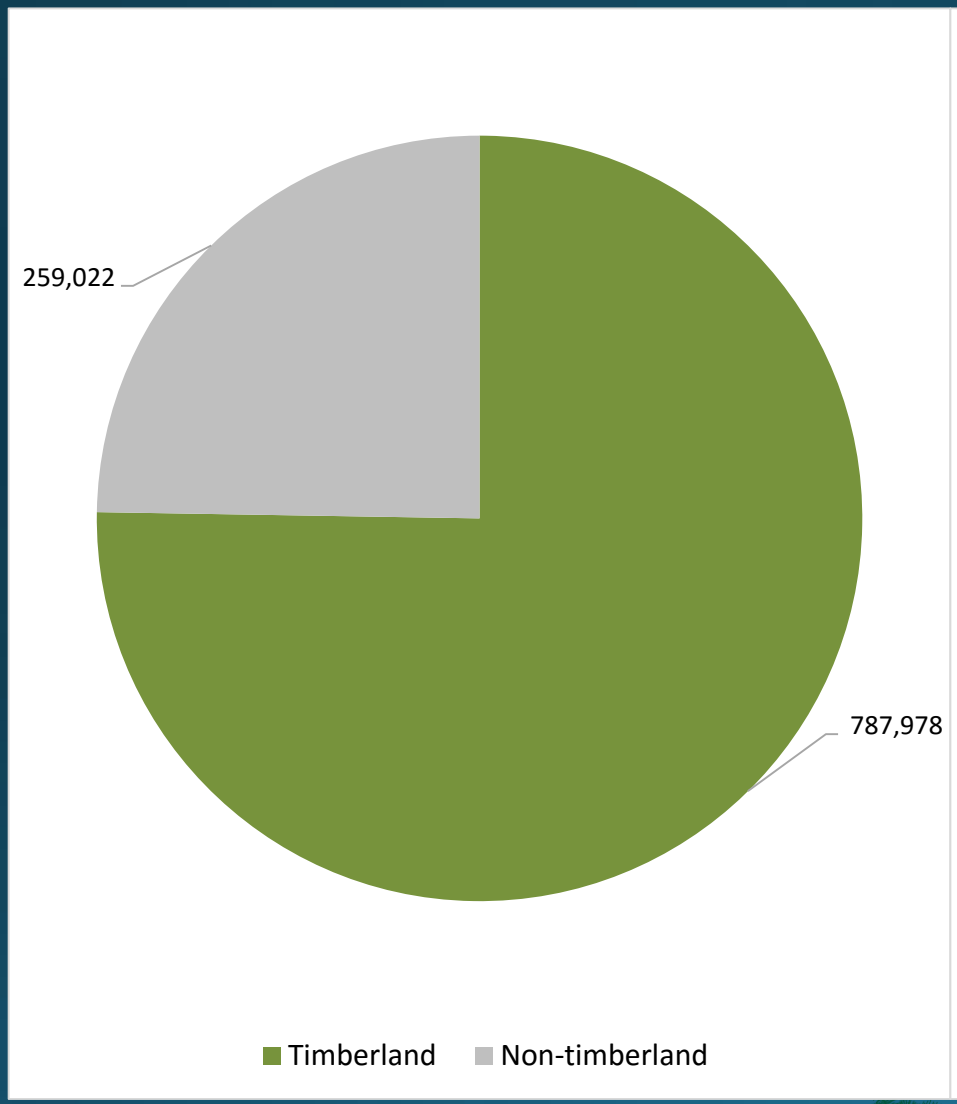
Expanded Area of Analysis – 20-towns plus surrounding

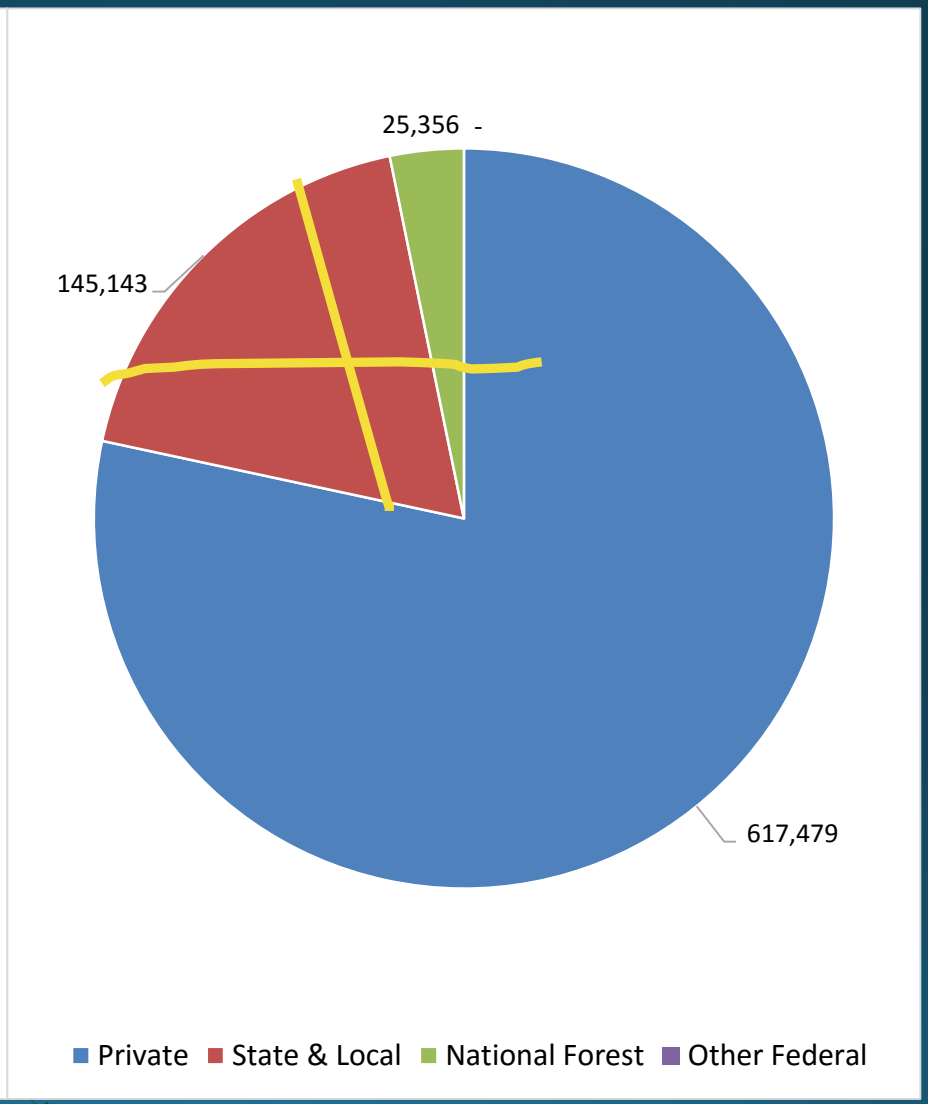
Forest Inventory and Analysis data (cont.)





Forest Inventory and Analysis data (cont.)

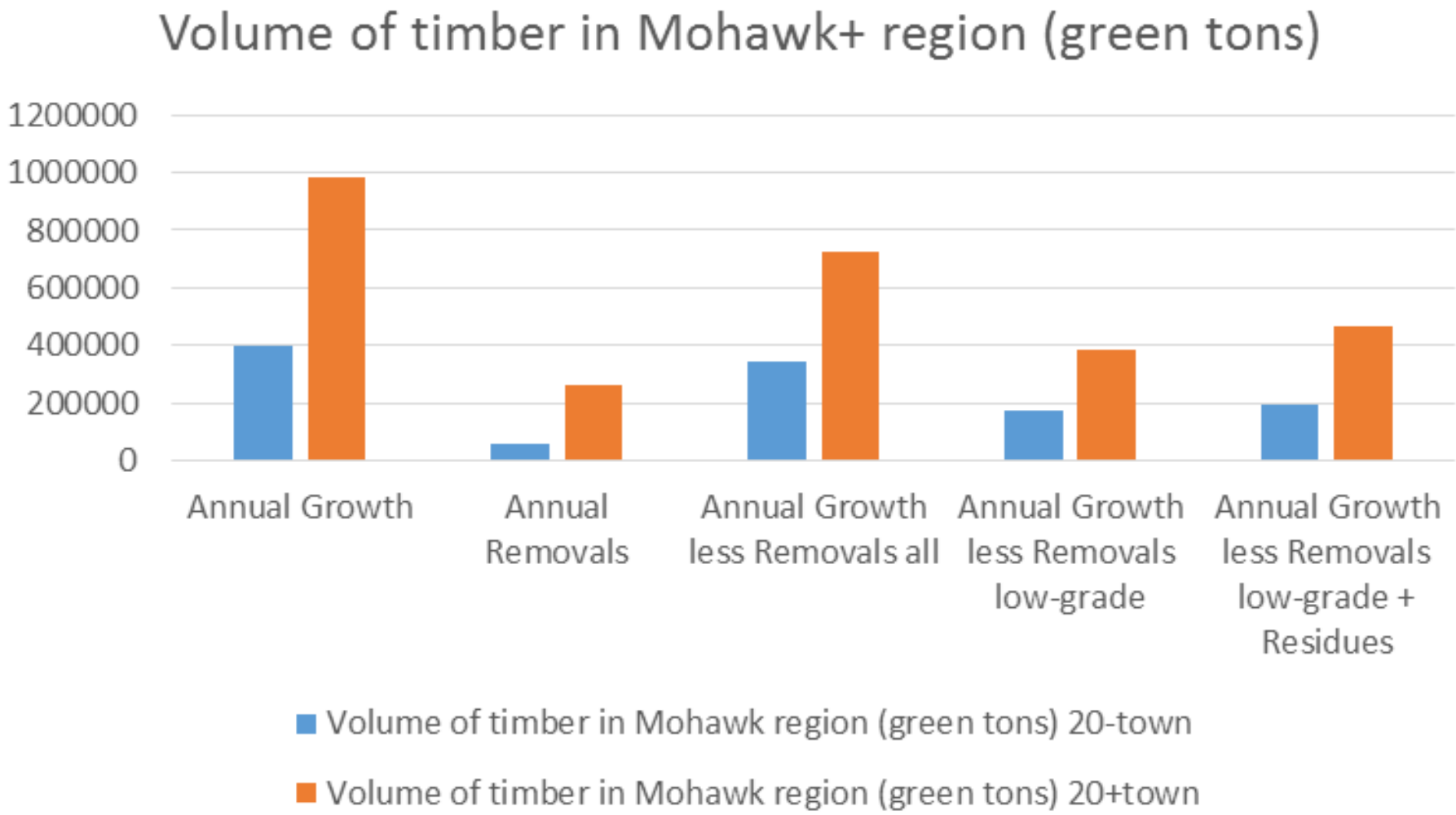




Forest Inventory and Analysis data (cont.)

	Softwood	Hardwood	Total
	green tons/yr		
Growth less Removals (non – sawtimber)	160,338	223,842	384,180
Residue	18,193	63,956	82,149
All Low-Grade			466,330

Forest Inventory and Analysis data (cont.)



Northern Forest Biomass Project Evaluator model runs

- Biomass Project Evaluator developed through a USDA Forest Service grant in 2013 by the North East *State* Foresters Association.

- BPE makes future projections of available wood from the forest of an area in the northeast U.S. based on a series of parameters.

3 different model runs:

1. Constant run – continue like today
2. Reduced growth run – 1% per year growth reduction
3. Increased demand run (pessimistic)- .5% increase wood per year, forest land reduced by 10% for region

Northern Forest Biomass Project Evaluator model runs (cont.)

Scenario Name: ohawk small run 1 pessimist

General

% of total standing bolewood volume that is low grade:	65%
% of total sawtimber harvest that is high-value (sawlog quality):	50%
% of tops and limbs inventory that is suitable/sustainable to extract for chipping:	75%

Private Timberland Ownership Proportions

% Corporate	5.0%
% Farm	2.0%
% Other Private	93.0%

% Other Private: 1-50acre parcels	30.0%
% Other Private: 50+acre parcels	70.0%

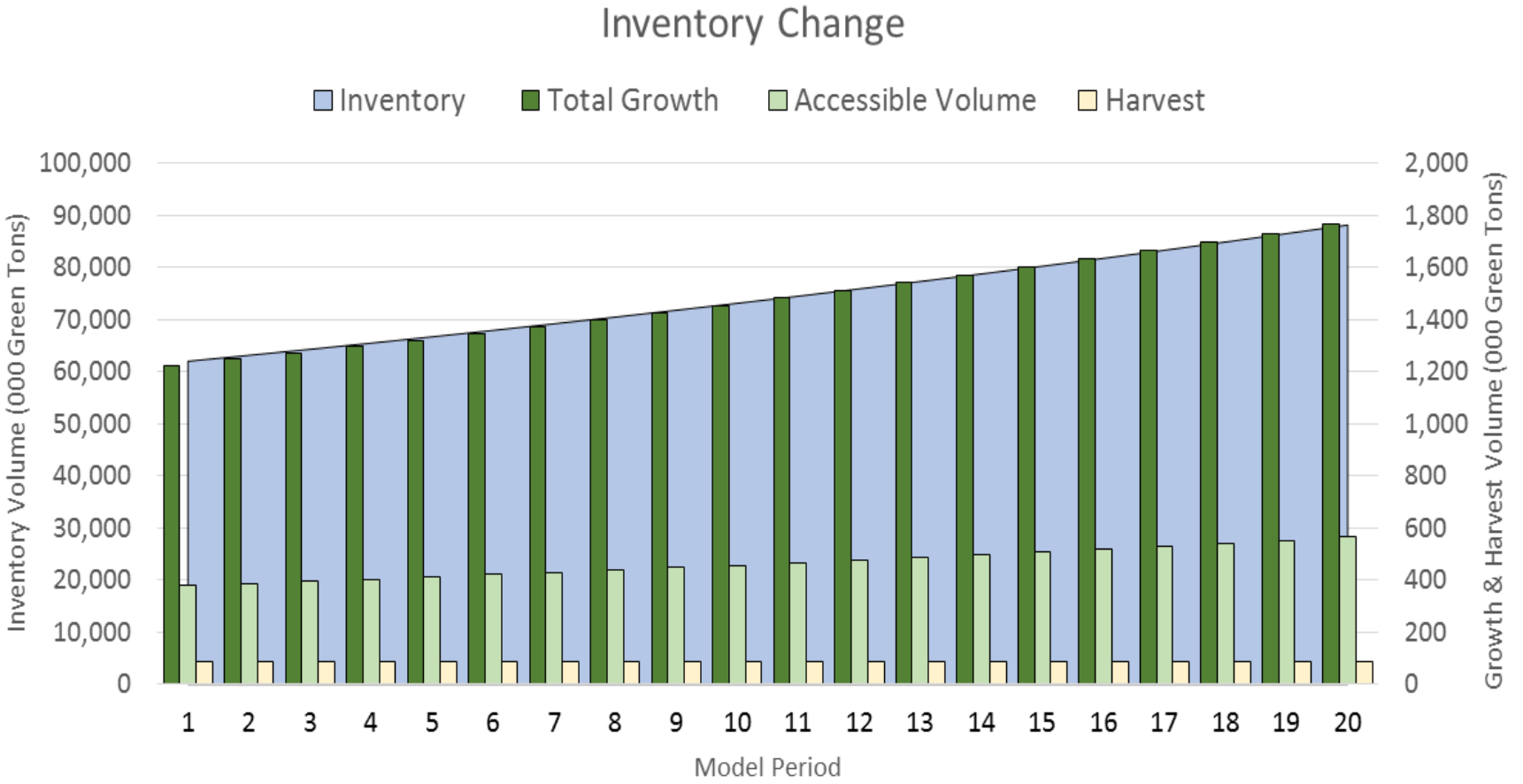
Physical Factors Limiting Access

Slope	1.0%
Elevation	1.0%
Wetlands	0.5%
Distance to Roads	1.0%
Deer Yards	0.0%
Stream Buffers	1.0%
Easements	0.5%
Other	0.0%
Total % Physically Inaccessible Acres:	**5.00%**

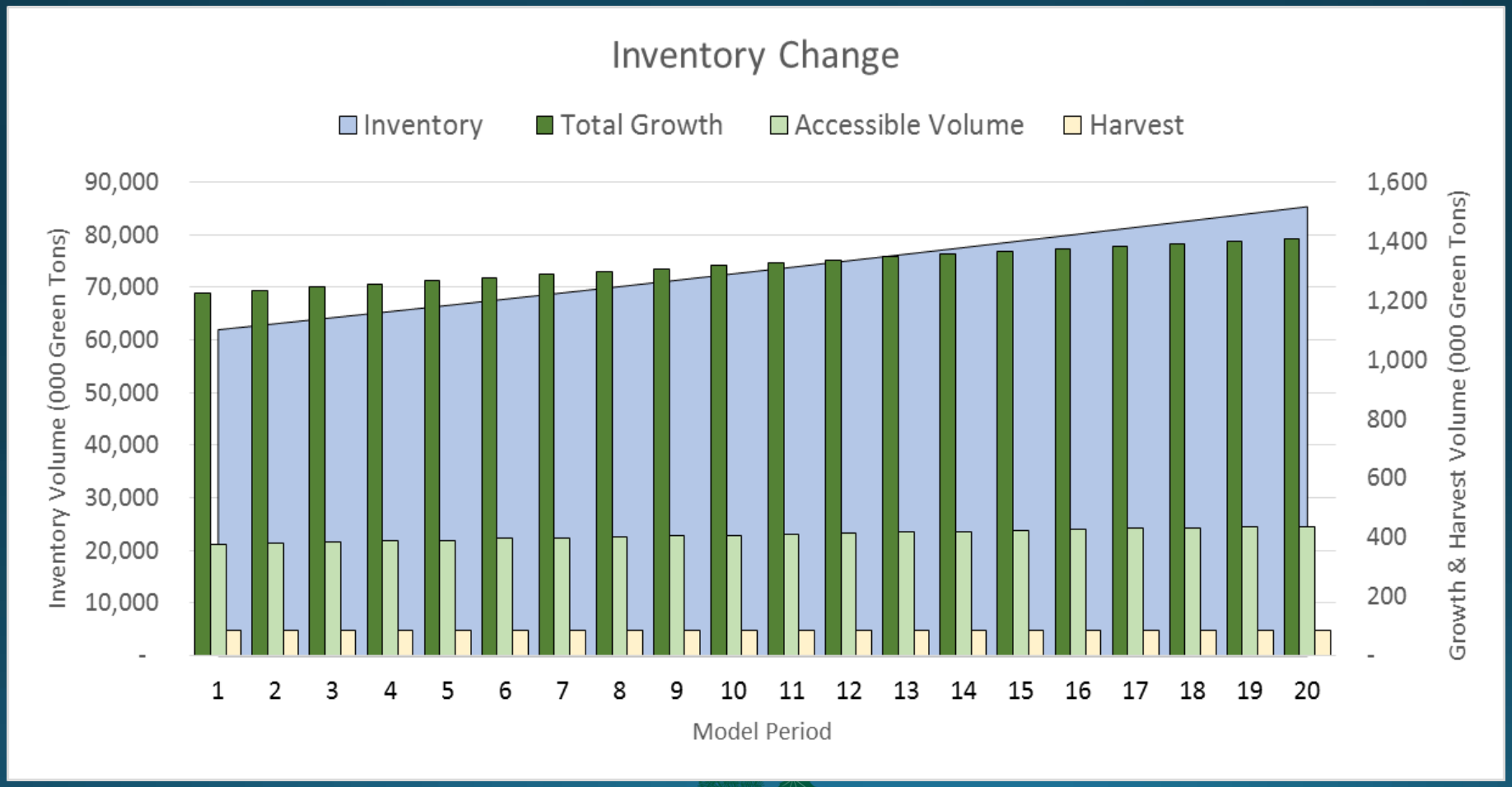
Ownership Impact on Accessibility

Federal	0.0%
State	0.0%
Municipal	0.0%
Farmer	50.0%
Corporate	90.0%
Private Parcels 1-50 acres	50.0%
Private Parcels 50+ acres	70.0%

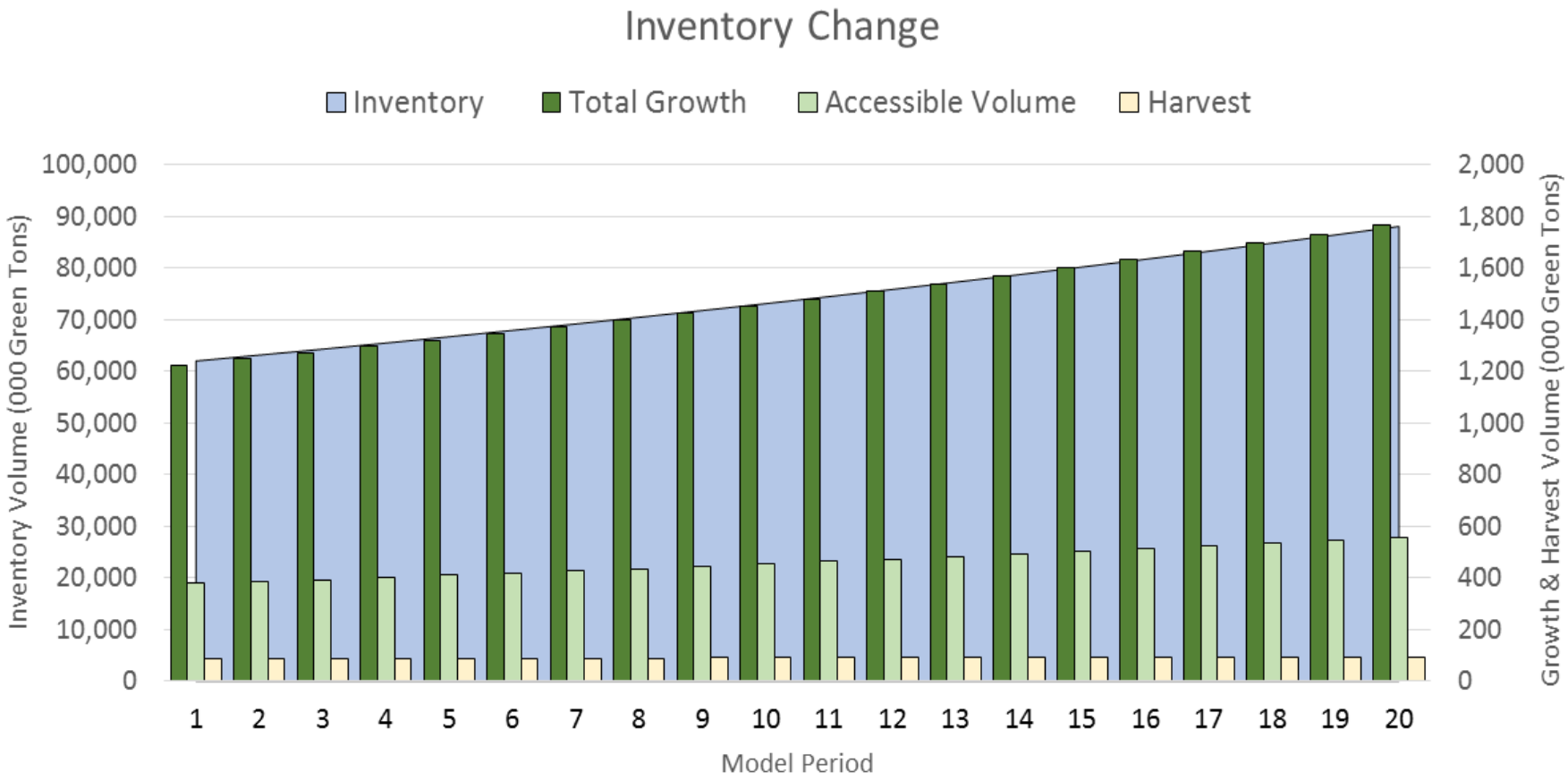
Constant run



Reduced growth run – 1% per year growth reduction

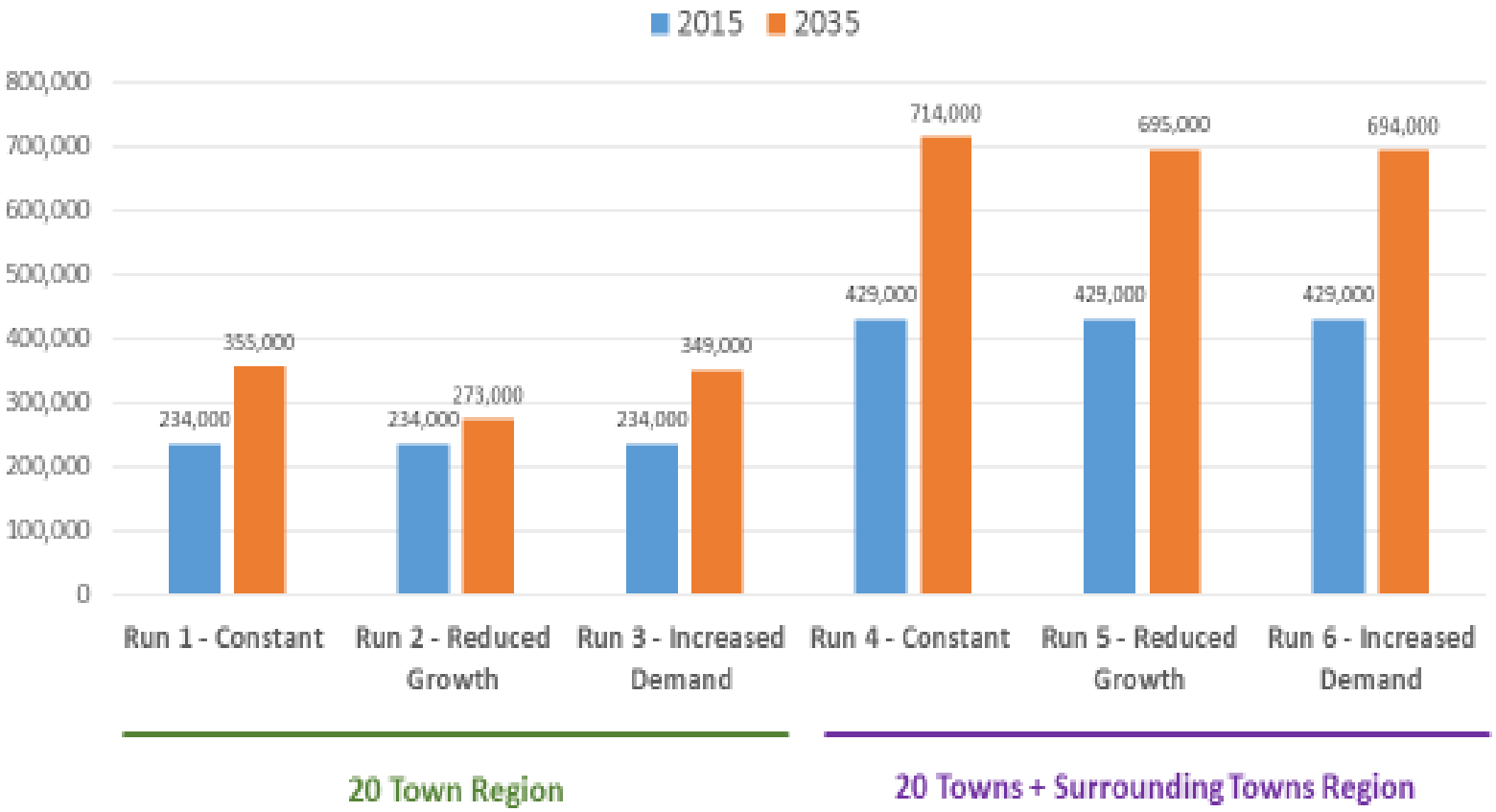


Increased demand run (pessimistic)- .5% increase wood per year, forest land reduced by 10% for region



BPE Scenario Runs

Available Woody Biomass for Energy (tons)



Other sources of wood fuel

Tops & Branches

Sawlogs

Low Grade Roundwood

Low $ value, left in woods or chipped; generally sold to large-scale biomass users, not thermal applications

High $ value, used for lumber production. Residue from lumber manufacturing (sawdust, slabs, etc.) can be used for biomass thermal, either directly or as pellet feedstock. (Competing uses exist.)

Pulpwood and other non-biomass applications

- Bole / mill chips (thermal users)
- Pellet mills (thermal intermediary)
- Cordwood (thermal users)

Storage

End User

Processed to consumer specifications and delivered (bulk, live floor, tipped)

Urban wood - wood derived from activities such as land clearing, tree services, wood from yard tree pruning and right-or-way maintenance. 12,400 green tons available annually but…

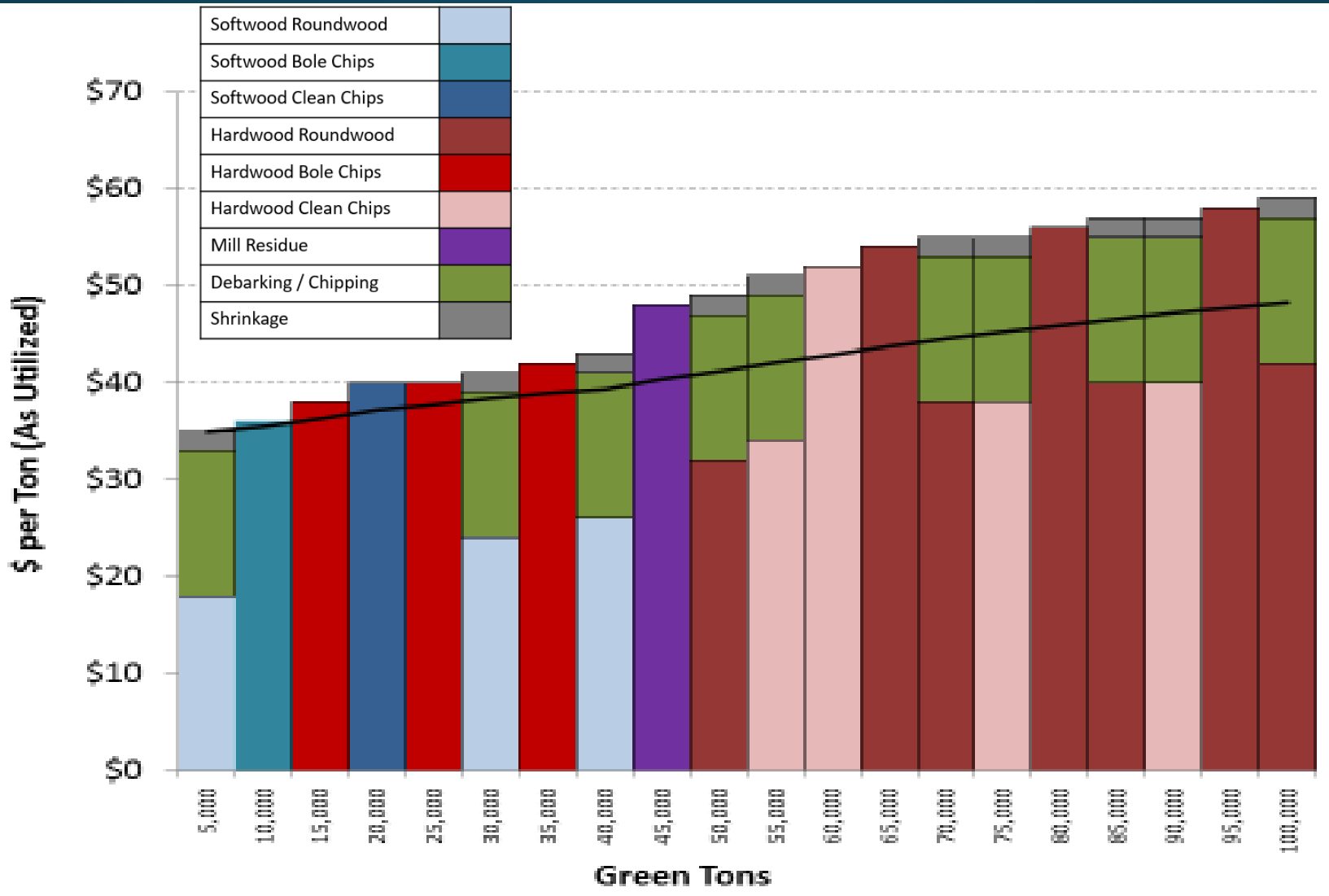
Challenge: urban wood not well suited to use in pellet mill:

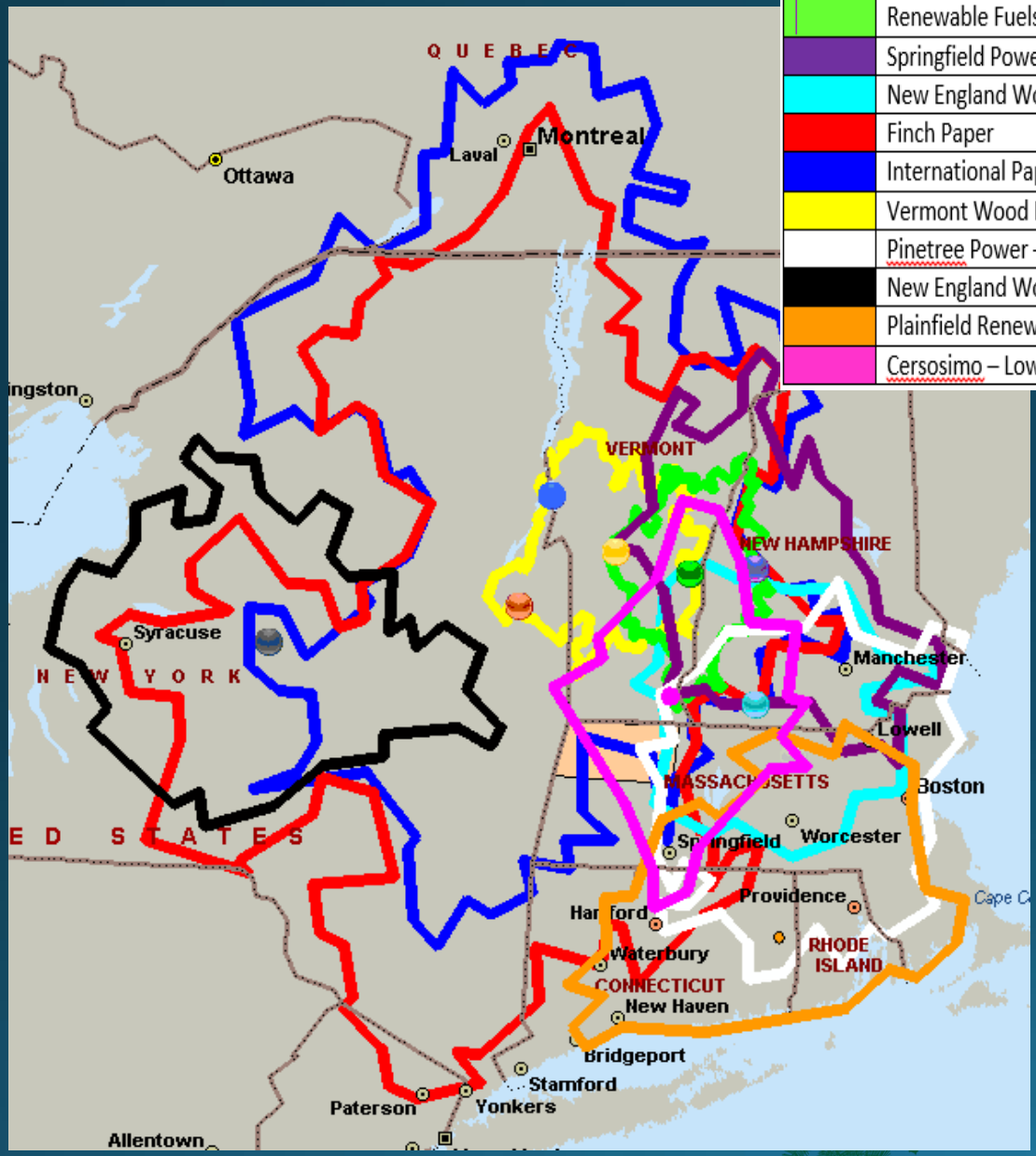
- very small individual quantities;
- Not to certain market specifications;
- A range of species and quality can be generated – pellet mills requires stringent wood cleanliness/quality specifications;
- Chipped or ground with the bark on - not a suitable feedstock for the production of quality pellets due to bark and lack of uniform size.

Sawmill and other wood using mill residues

We assume **5,000 tons** of sawmill residues might be available annually to a wood pellet mill developed in the region (from 3 mills nearby).

Cost curves – likely price of wood feedstock by volume





Color	Facility	Wood Use (g tons, est.)	Drive Time (min)
	Renewable Fuels of Vermont	38,000	60
	Springfield Power	200,000	90
	New England Wood Pellets - Jaffrey, NH	200,000	90
	Finch Paper	690,000	180
	International Paper -Ticonderoga	1,500,000	180
	Vermont Wood Pellets	40,000	60
	Pinetree Power – Fitchburg	225,000	90
	New England Wood Pellets – Schuyler, NY	200,000	90
	Plainfield Renewable Energy	~220,000 (clean only)	90
	Cersosimo – Low Grade Wood Yard	50,000	75

Major low-grade wood users

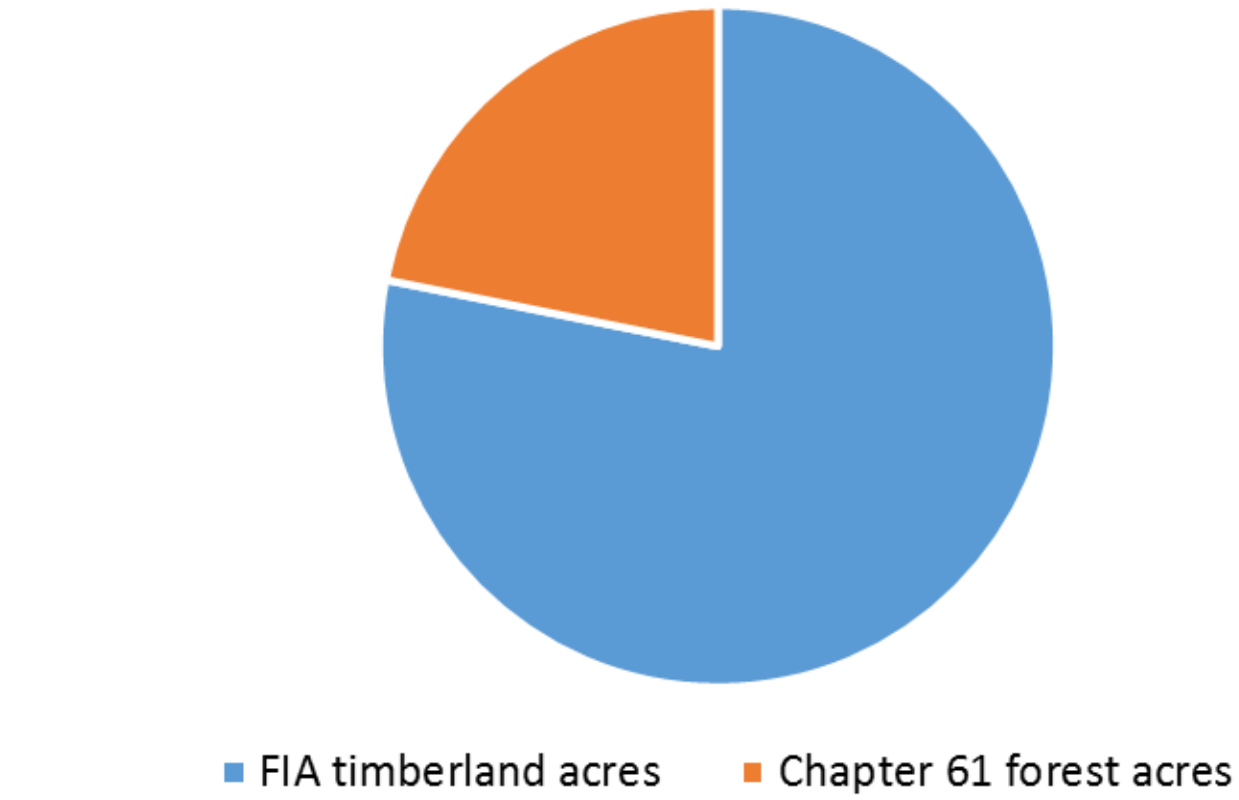
Chapter 61 and 132 information

- An analysis of Chapter 61 lands and Chapter 132 Forest Cutting Plan data was conducted.

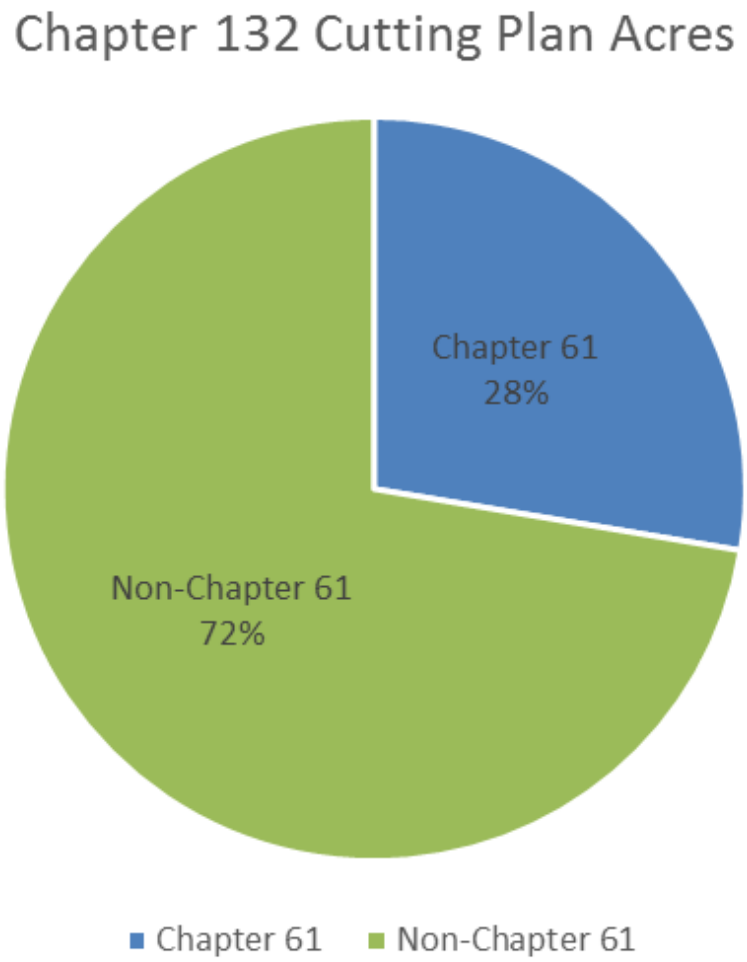
- These analyses are intended to further understand the role of Chapter 61 forest lands – where a licensed forester has developed a forest management (stewardship) plan – on forestry and low-grade wood availability in the region.

- On these lands, it is assumed that projected harvests and actual harvests are being conducted in a sustainable manner and, with the data from all the lands and harvests in the 20-town region, we hope to gain some additional insight into what might be available to harvest on these lands among other useful information.

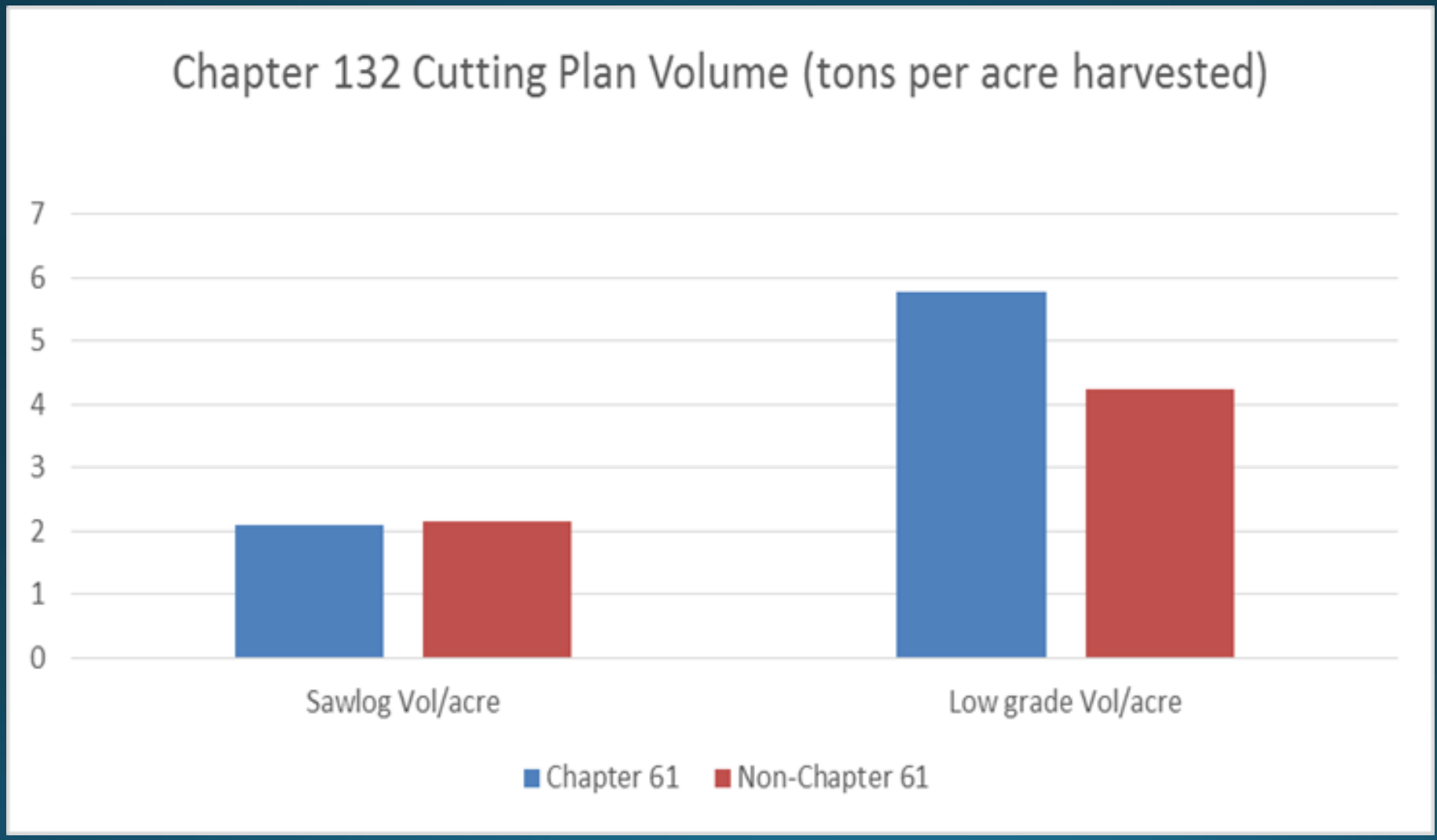
Chapter 61 and 132 information (cont.)



Chapter 61 and 132 information (cont.)



Chapter 61 and 132 information (cont.)



Siting a wood pellet plant in the Mohawk region

Profitable wood pellet manufacturing depends on a careful optimization of several factors:

- Close proximity to sufficient quality and quantity of wood feedstock to source the plant as cost effectively as possible;
- Close proximity to market demand for full output of plant that will enable the plant to run at or close to capacity throughout the year;
- Well designed and engineered plant and equipment to minimize downtime, and a design capacity for which there will be demand for 100% of the output within 2-3 years after the plant comes on line;
- Close proximity to an efficient highway transportation network;
- Sufficient working capital to allow owner to operate at capacity through extended periods of inventory build, such as during non-heating months or unusually warm winters;
- A supportive community and appropriately-zoned land, preferably with no nearby residential development, and access to reliable three-phase electric power.

Range of sizes for wood pellet plants in northeast U.S.:

- 20,000 tons of annual pellet production to 100,000 tons

- Translates to 40,000 to 200,000 tons of feedstock needed per year.

Range of feedstock available is:

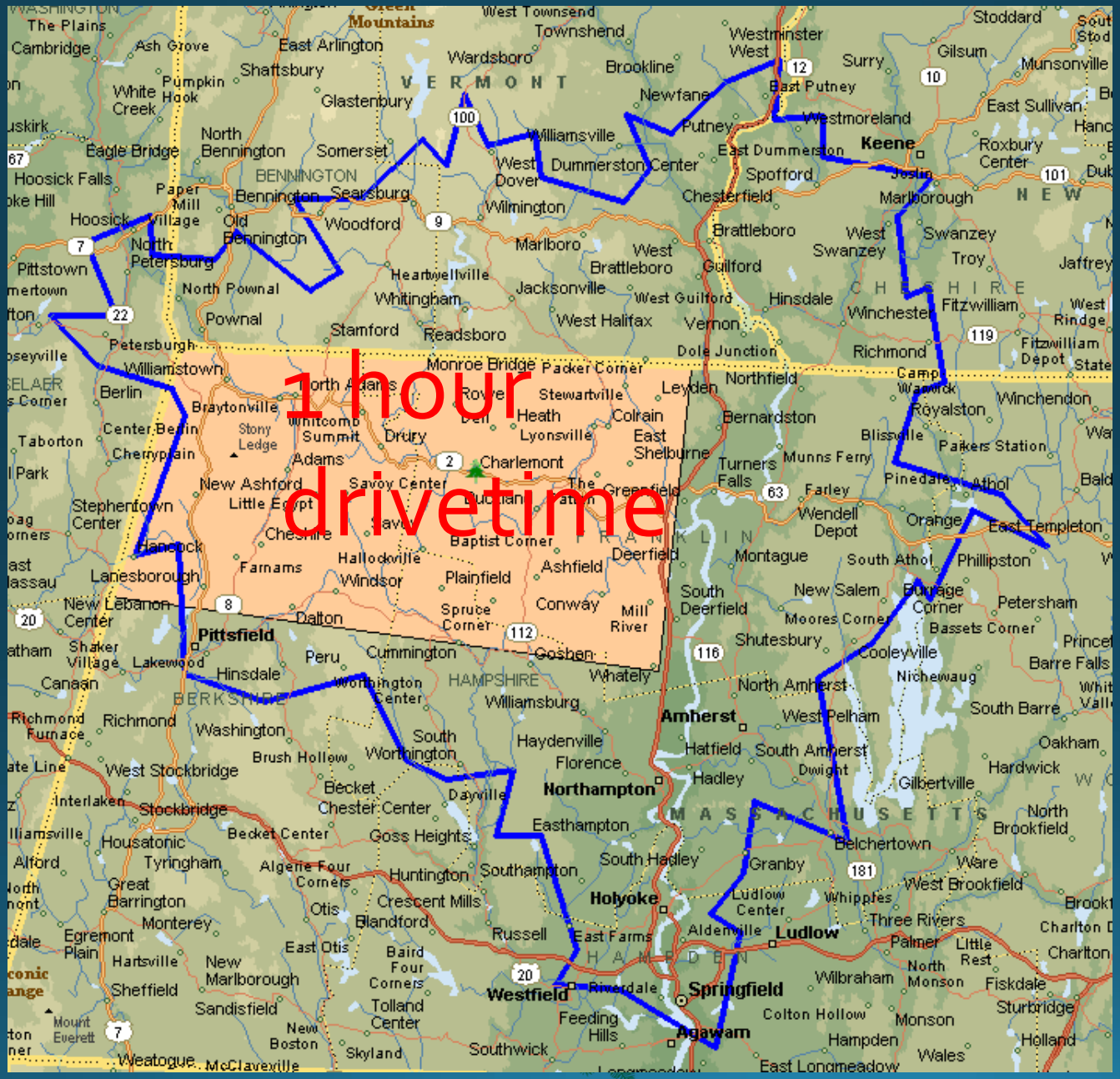
- 193,000 tons on the very conservative side

- 429,000 tons on the more realistic side today and that goes to over 700,000 tons annually in the year 2035.

Design elements for a wood pellet plant:

Report goes into much more detail about essential design elements of a pellet plant…

Siting a wood pellet plant in the Mohawk region (cont.)



Siting a wood pellet plant in the Mohawk region (cont.)

To source wood feedstock supply:

Description of Supplier	Number	Type of feedstock
Large mechanized fully integrated contractor: Feller/buncher, grapple skidder(s), flail debarker, chipper, livefloor chip van(s), tri-axle with pup trailer	3 -6	Flail debarked chips and roundwood
Medium mechanized cut to length contractor: feller/buncher, forwarder, grapple skidder, chipper, livefloor van, tri-axle with pup trailer	3 -6	Bark-on bole chips and roundwood
Small conventional logging contractor: forwarder/cable skidder, tri-axle with pup trailer	15 -20	roundwood
Miscellaneous tree service/municipal road crew wood that meets high quality specification	6 - 10	
Mill residues	2-4	Clean mill chips and sawdust
TOTAL		Plant using 40,000 – 200,000 green tons of wood feedstock per year

Refined, Semi-Dry Chips

Refined/Semi-Dry Wood Chips, or "RDCs" are chips that meet a tight size and moisture content specification

Elements of RDC supply chain:

-forest landowners;

-foresters;

-loggers/truckers;

-inventory yard,

-processing and storage;

-access to a truck scale; and

- truck transportation to end consumer

Refined, Semi-Dry Chips (cont.)

RDC advantage and disadvantage:

-advantage over pellets in that they can be produced at a fraction of the sizable multi-million dollar investment required for pellet manufacturing

- disadvantage that they can only be used in larger boilers typically in commercial, municipal or institutional scaled buildings, and not residential boilers. However, at this scale, boiler cost is roughly the same as for pellet (though fuel storage may cost more), but operating cost in $/MMBTU heat output is considerably lower.

Conclusion

INRS used a number of data and info sources, relying most heavily on the USDA Forest Service's national Forest Inventory and Analysis (FIA) dataset.

- 40,000 to 200,000 green tons of raw-material feedstock needed annually.
- Minimum of 193,000 is readily available today on the very conservative side and 429,000 tons on the more realistic side - increasing to over 700,000 tons annually by the year 2035.
- **INRS concludes that such a wood using facility can readily obtain a sustainable supply of wood fuel from the forests of the 20-town and nearby surrounding areas, supplemented by a small amount of wood-using mill residues.**

Innovative Natural Resource Solutions, LLC

www.inrsllc.com